

General Requirements

1. SCOPE

Work shall consist of furnishing all equipment and materials and performing all operations in connection with construction of the project as shown on the drawings, described in the special provisions and as staked in the field.

2. RESPONSIBILITIES

Owner/Operator--is the official spokesperson for the project and enters into all contractual agreements, obtains all permits and easements necessary for construction, insures construction is in accordance with the plans, specifications and special provisions, and is financially responsible for the project.

Technician--is the responsible Natural Resources Conservation Service (NRCS) representative who has authority to review project construction and make necessary tests to insure that all work is in compliance with the construction plans. The technician makes recommendations to the owner/operator concerning changes and acceptance of the work.

Contractor--is the individual who has an agreement with the owner/operator to construct the project.

3. SAFETY

General--Equipment and methods used in construction shall be in accordance with United States Department of Labor, Occupational Safety and Health Administration (OSHA) regulations.

Trenching--When personnel must enter trenches or other excavations, safety requirements of OSHA Safety and Health Standards, Part 1926, Safety and Health Regulations for Construction, Subpart P, Excavations, shall be followed.

Utilities--There is great hazard to life and property from the disturbance of utilities by construction equipment. It is the owner/operator's responsibility to do the following prior to construction:

1. Notify all applicable aboveground and belowground utility companies of the location and kind of work to be done and proposed date that work will start.
2. Request that utility owners assist in locating and staking underground utilities on-site.
3. Request that a utility company employee be present during construction within the utility right-of-way.
4. Notify the contractor of location of all utilities.

Known utilities are shown on the drawings. The NRCS makes no representation of the existence or non-existence of any utilities.

4. PROJECT MODIFICATIONS

Any modifications resulting in changes in the project as specified in the drawings and specifications must be approved by NRCS prior to installation.

5. ENVIRONMENTAL CONSIDERATIONS

Construction operations shall be carried out in a manner to ensure that erosion and air and water pollution are minimized and within legal limits.

6. CULTURAL RESOURCES

If cultural material is discovered, construction work shall cease within 200 feet of the discovery area. NRCS field office personnel shall be notified, at which time they will contact the NRCS Cultural Resource Specialist for further instructions. Work may not resume in the discovery area until approval is given by field office personnel. Cultural material includes bones, fire hearths, flakes/points/scrapers, human remains or foundations.

7. REFERENCES

The following abbreviations will be used to designate the organizations who publish the referenced "Standard Specifications":

ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
ACI	American Concrete Institute
FEDERAL	Federal Specifications
ANSI	American National Standard Institute (American Society of Mechanical Engineers)
AASHTO	American Association of State Highway and Transportation Officials

The following abbreviations are used to designate technical or regulating agencies:

NRCS	U.S. Department of Agriculture, Natural Resources Conservation Service (Specifications) (Construction Specifications)
OSHA	U.S. Department of Labor, Occupational Safety and Health Administration
EPA	U.S. Environmental Protection Agency

Excavation

1. SCOPE

The work shall consist of the excavation required by the drawings, specifications and special provisions, as well as, disposal of the excavated materials.

2. CLASSIFICATION

Unless otherwise specified in the special provisions, all excavation will be common.

Excavation will be classified as common excavation or rock excavation in accordance with the following definitions or will be designated as unclassified.

Common excavation shall be defined as the excavation of all materials that can be excavated, transported, and unloaded by the use of heavy ripping equipment and wheel tractor-scrapers with pusher tractors. Also excavated material that can be dumped into place or loaded onto hauling equipment by means of excavators having a rated capacity of one cubic yard. The excavators shall be equipped with attachments (such as shovel, bucket, backhoe, dragline or clam shell) appropriate to the character of the materials and the site conditions.

Rock excavation shall be defined as the excavation of all hard, compacted or cemented materials, the accomplishment of which requires blasting or the use of excavators larger than defined for common excavation.

The excavation and removal of isolated boulders or rock fragments larger than one cubic yard in volume encountered in materials otherwise conforming to the definition of common excavation shall be classified as rock excavation.

Excavation will be classified according to the above definitions by the Technician, based on his judgment of the character of the materials and the site conditions.

The presence of isolated boulders or rock fragments larger than one cubic yard in size will not in itself be sufficient cause to change the classification of the surrounding material.

For the purpose of this classification, the following definitions shall apply:

Heavy ripping equipment shall be defined as a rear-mounted, heavy duty, single-tooth, ripping attachment mounted on a tractor having a power rating of 200 or greater net horsepower (at the flywheel).

Wheel tractor-scraper shall be defined as a self-loading (not elevating) and unloading scraper having a struck bowl capacity of 12-20 yards.

Pusher tractor shall be defined as a track-type tractor having a power rating of 200 or greater net horsepower (at the flywheel) equipped with appropriate attachments.

3. UNCLASSIFIED EXCAVATION

Items designated as "Unclassified Excavation" shall include all materials encountered regardless of their nature or the manner in which they are removed. When excavation is unclassified, none of the definitions or classifications stated in Section 2 of this specification shall apply.

4. STRIPPING

Stripping consists of excavating the top layer of soil which contains vegetation, roots and other undesirable organic matter. Stripping is required at all sites upon which embankments and fills are to be constructed, and at required excavations and borrow areas required for the proper installation of the work.

Stripping of Base for Embankments for Dams, Dikes, and Canals

Areas to be covered by embankments and fills shall be stripped of all vegetation, and the topsoil removed to sufficient depth to expose subsoil reasonably free of roots and other organic matter. All slopes within the limits of foundations and abutments, except pipe trenches, shall be excavated to slopes not steeper than one to one (1:1) unless otherwise indicated on the drawings. The foundation shall be cleared of all loose unconsolidated material to provide a firm base.

Stripping Borrow Areas and Required Excavations

Required excavations and areas from which borrow materials are to be obtained shall be stripped of all vegetation, and topsoil

shall be removed to sufficient depth to expose subsoil reasonably free of roots and other organic matter.

Use of Materials from Stripping Materials which are suitable for spreading over disturbed areas after construction has been completed shall be stockpiled and subsequently spread as directed by the Technician.

Materials suitable for use in construction of the required earthfill shall be used as directed by the Technician.

Unsuitable and/or excess materials shall be wasted as directed by the Technician.

The suitability of materials for specific purposes will be determined by the Technician.

5. BLASTING

The transportation, handling, storage, and use of dynamite and other explosives shall be directed and supervised by a properly licensed person. Material Safety Data Sheets (MSDS) for dynamite and other explosive materials shall be provided to the Technician prior to the blasting operation.

Blasting shall be done in such a way as to prevent damage to the work or unnecessary fracturing of the foundation and shall conform to any requirements in the special provisions.

6. USE OF EXCAVATED MATERIALS

To the extent they are needed, all suitable materials from the specified excavations shall be used in the construction of

required permanent earthfill or rockfill. The suitability of materials for specific purposes will be determined by the Technician. The Contractor shall not waste or otherwise dispose of suitable excavated materials.

7. DISPOSAL OF WASTE MATERIALS

All surplus or unsuitable excavated materials will be designated as waste and shall be disposed of by the Contractor at sites of his or her own choosing away from the site of the work as approved by the owner/operator.

8. BRACING AND SHORING

Excavated surfaces too steep to be safe and stable if unsupported shall be supported as necessary to safeguard the work and workers, to prevent sliding or settling of the adjacent ground, and to avoid damaging existing improvements.

All work shall be in accordance with safety requirements of Occupational Safety and Health Administration (OSHA) Safety and Health Standards, Part 1926, Safety and Health Regulations for Construction, Subpart P, Excavations.

9. STRUCTURE AND TRENCH EXCAVATION

Structure or trench excavation shall be completed to the specified elevations and to sufficient length and width to include allowance for forms, bracing and supports, as necessary, before any concrete, pipe, other structure or earthfill is placed within the limits of the excavation.

10. BORROW EXCAVATION

When the quantities of suitable materials obtained from specified excavations are insufficient to construct the specified fills, additional materials shall be obtained from borrow areas approved by the technician, as agreed-to by the owner/operator.

Borrow pits shall be excavated and finally dressed in a manner to eliminate unstable side slopes or other hazardous or unsightly conditions.

11. OVER EXCAVATION

Unless otherwise approved by the Technician, excavation in rock beyond the specified lines and grades shall be corrected by filling the resulting voids with portland cement concrete. Rock surfaces shall be thoroughly cleaned and dewatered prior to placement of the concrete. Concrete shall be made of materials and mix proportions approved by the Technician. Concrete that will be exposed to the atmosphere when construction is completed shall contain not less than 6 sacks of cement per cubic yard of concrete. Concrete that will be permanently covered shall contain not less than 4-1/2 sacks of cement per cubic yard.

Excavation in earth beyond the specified lines and grades shall be corrected by filling the resulting voids with approved compacted earthfill. If the backfill is to become the subgrade for riprap, rockfill, or sand or gravel bedding, the voids may be filled with material conforming to the specifications for the riprap, rockfill, bedding or gravel.

12. MEASUREMENT AND PAYMENT

(Used only if applicable)

For items of work for which specific unit prices are established, each item will be measured to the nearest unit applicable. Payment for each item will be made at the agreed-to unit price for that item. For items of work for which specific lump sum prices are established, payment will be made at the lump sum price.

Such payment will constitute full compensation for all materials, labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Compensation for any item of work shown on the drawings or described in the special provisions but not listed on the bid schedule will be considered incidental to and included in the pay items listed on the bid schedule.

Earthfill

1. SCOPE

The work shall consist of construction of earth embankments and other earthfill required by the drawings and specifications.

2. MATERIALS

All fill materials shall be obtained from required excavations and designated borrow areas. The selection, blending, routing and disposition of materials in the various fills shall be subject to approval by the Technician.

Fill materials shall contain no sod, brush, roots or other perishable materials. Unless otherwise specified, rock fragments incorporated in the fill shall be no larger than one-half of the lift thickness specified for each type of fill. Oversized material shall be removed prior to compaction.

The types of materials used in the various fills shall be as listed and described in the special provisions and drawings.

3. FOUNDATION PREPARATION

Foundations for earthfill shall be stripped to remove vegetation and other unsuitable materials or shall be excavated as specified.

Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened to a minimum depth of two inches. The moisture content of the loosened material shall be controlled as specified for the earthfill, and the surface materials of the foundation shall be compacted and bonded with

the first layer of earthfill as specified for subsequent layers of earthfill.

Earth abutment surfaces shall be free of loose, uncompacted earth in excess of two inches in depth normal to the slope and shall be at such a moisture content that the earthfill can be compacted against them to effect a good bond between the fill and the abutments.

Rock foundation and abutment surfaces shall be cleared of all loose materials by hand or other effective means and shall be free of standing water when fill is placed upon them. Occasional rock outcrops in earth foundations for earthfill, except in dams and other structures designed to restrain the movement of water, shall not require special treatment if they do not interfere with compaction of the foundation and initial layers of the fill or the bond between the foundation and the fill.

Foundation and abutment surfaces shall be no steeper than one horizontal to one vertical unless otherwise specified. Test pits or other cavities shall be filled with compacted earthfill conforming to the specifications for the earthfill to be placed upon the foundation.

4. PLACEMENT

Fill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the Engineer. Fill shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the fill.

Fill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed the maximum thickness specified, or eight inches if not specified. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than the specified thickness before being compacted. Hand compacted fill, including fill compacted by manually directed power tampers, shall be placed in layers whose thickness before compaction does not exceed the maximum thickness specified for layers of fill compacted by manually directed power tampers, or six inches if not specified.

Adjacent to structures, fill shall be placed in a manner which will prevent damage to the structures and will allow the structures to assume the loads from the fill gradually and uniformly. The height of the fill adjacent to a structure shall be increased at approximately the same rate on all sides of the structure.

Earthfill in dams, levees and other structures designed to restrain the movement of water shall be placed so as to meet the following additional requirements:

- a. The distribution of materials throughout each zone shall be essentially uniform, and the fill shall be free from lenses, pockets, streaks or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material.
 - b. If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified
- parallel to the axis of the fill to a depth of not less than two inches before the next layer is placed.
- c. The top surfaces of embankments shall be maintained approximately level during construction, except that a crown or cross-slope of approximately two percent shall be maintained to insure effective drainage, and except as otherwise specified for drainfill or sectional zones.
 - d. Dam embankments shall be constructed in continuous layers from abutment to abutment except where openings to facilitate construction or to allow the passage of stream flow during construction are specifically authorized.
 - e. Embankments built at different levels as described under (c) or (d) above shall be constructed so that the slope of the bonding surfaces between embankment in-place and embankment to be placed is not steeper than three feet horizontal to one foot vertical. The bonding surface of the embankment in-place shall be stripped of all material not meeting the requirements of this specification. The bonding surface shall be scarified, moistened and recompacted when the new fill is placed against it as needed to insure a good bond with the new fill and to obtain the specified moisture content and density at the contact of the in-place and new fills.

5. CONTROL OF MOISTURE CONTENT

Unless otherwise specified, the moisture content of the fill material shall be maintained within the range required to permit maximum compaction. The moisture content in plastic clays and silts should be such that when kneaded in the hand it will form a ball which does not readily separate when struck sharply with a pencil or which refuses to separate when pressed between the hands.

When working with sandy materials, the moisture content should be such that the material tends to form a ball under pressure, but seldom holds together.

The application of water to the fill materials shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the materials after placement on the fill, if necessary. Uniform moisture distribution shall be obtained by disking.

Material that is too wet (yields free water when kneaded in the hand) when deposited on the fill shall either be removed or be dried to the proper moisture content prior to compaction.

If the top surface of the preceding layer of compacted fill or a foundation or abutment surface in the zone of contact with the fill becomes too dry to permit suitable bond it shall either be removed or scarified and moistened by sprinkling to an acceptable moisture content prior to placement of the next layer of fill.

6. COMPACTION

Unless otherwise specified, earthfill shall be Class C

compaction, by one or a combination of the following methods:

1. Controlled movement of the hauling and spreading equipment over the area so that the entire surface area of each lift will be traversed by not less than one tread track of the loaded earth-moving equipment traveling in a direction parallel to the axis of the fill.

2. Each lift shall be compacted by not less than two complete passes of sheepsfoot tamping roller exerting a minimum pressure of 100 pounds per square inch.

Unless otherwise specified, fill adjacent to structures shall be compacted to a density equivalent to that of the surrounding fill by means of hand tamping or manually directed power tampers or plate vibrators.

The completed fill shall be constructed to the lines and grades shown on the plans or as staked by the Technician, plus the allowance indicated for settlement.

7. COMPACTION ADJACENT TO STRUCTURES

Heavy equipment including backhoe mounted power tampers, or vibrating compactors and manually directed vibrating rollers, shall not be operated within two feet of any structure. Towed or self-propelled vibrating rollers shall not be operated within five feet of any structure. Compaction by means of drop weights operating from a crane or hoist will not be permitted.

The passage of heavy equipment will not be allowed: (1) over cast-in-place conduits prior to 14 days after placement of the concrete; (2) over cradled or bedded precast conduits prior to 7 days after placement of the concrete cradle or

TABLE 1

Structure	Time Interval
Retaining walls and counterforts (impact basins)	14 days
Walls backfilled on both sides simultaneously	7 days
Conduits and spillway risers, cast-in-place (with inside forms in place)	7 days
Conduits and spillway risers, cast-in-place (inside forms removed)	14 days
Conduits, precast, cradled	2 days
Conduits, precast, bedded	1 day
Cantilever outlet bents (backfilled both sides simultaneously)	3 days

bedding; or (3) over any type of conduit until the backfill has been placed above the top surface of the structure to a height equal to one-half the clear span width of the structure or pipe or two feet, whichever is greater.

Compacting of fill adjacent to structures shall not be started until the concrete has attained the strength specified. The strength will be determined by compression testing of test cylinders cast by the Technician for this purpose and cured at the work site in the manner specified in ASTM Method C 31 for determining when a structure may be put into service.

When the required strength of the concrete is not specified as described above, compaction of fill adjacent to structures shall not be started until the time intervals shown in Table 1 have elapsed after placement of the concrete.

8. REWORKING OR REMOVAL AND REPLACEMENT OF DEFECTIVE FILL

Fill placed at densities lower than the specified minimum density or at moisture contents outside the

specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements or removed and replaced by acceptable fill. The replacement fill and the foundation, abutment and fill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control and compaction.

9. TESTING

During the course of the work, the Technician may perform such tests as are required to identify materials, to determine compaction characteristics, to determine moisture content, and to determine density of fill in place. These tests performed by the Technician will be used to verify that the fills conform to the requirements of the specifications. Such tests are not intended to provide the Contractor with the information required by him for the proper execution of the work and their performance shall not relieve the Contractor of the necessity to perform tests for that purpose.

10. MEASUREMENT AND PAYMENT

(Used only if applicable)

For items of work for which specific unit prices are established, each item will be measured to the nearest unit applicable. Payment for each item will be made at the agreed-to unit price for that item. For items of work for which specific lump sum prices are established, payment will be made at the lump sum price.

Such payment will constitute full compensation for all materials, labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Compensation for any item of work shown on the drawings or described in the special provisions but not listed on the bid schedule will be considered incidental to and included in the pay items listed on the bid schedule.

Rock Riprap

1. SCOPE

The work shall consist of the construction of loose rock riprap revetments and blankets, including filter layers or bedding where specified.

2. MATERIALS

Rock

Rock for rock riprap shall be obtained from the designated sources or, if the source is not specified, shall conform to the following specifications:

Individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The rock fragments shall be angular to subrounded in shape. The least dimension of an individual rock fragment shall be not less than one-third the greatest dimension of the fragment.

Unless otherwise specified and except as provided below, the rock shall have the following properties:

- a. Bulk specific gravity (saturated surface-dry basis) not less than 2.5.
- b. Absorption not more than 2 percent.
- c. Soundness: Weight loss in 5 cycles not more than 10 percent when sodium sulfate is used or 15 percent when magnesium sulfate is used.

The bulk specific gravity and absorption shall be determined by ASTM Method C 127. The test

for soundness shall be performed by ASTM Method C 88 for coarse aggregate modified as follows:

The test sample shall not be separated into fractions. It shall consist of 5000 + 300 grams of rock fragments, reasonably uniform in size and shape and weighing approximately 100 grams each, obtained by breaking the rock and selecting fragments of the required size.

After the sample has been dried, following completion of the final test cycle and washing to remove the sodium sulfate or magnesium sulfate, the loss of weight shall be determined by subtracting from the original weight of the sample the final weight of all fragments which have not broken into three or more pieces.

The report shall show the percentage loss of weight and the results of the qualitative examination.

Rock that fails to meet the requirements stated in a, b, and c above, may be accepted only if similar rock from the same source has been demonstrated to be sound after five years or more of service under conditions of weather, wetting and drying, and erosive forces similar to those anticipated for the rock to be installed under this specification.

Filter and bedding materials

When required, filter and bedding materials shall, unless otherwise specified, conform to Montana Construction Specification MT-117, Drainfill and Filters.

3. GRADING

The rock shall conform to the specified grading limits after it has been placed in the riprap.

The rock shall be free from dirt, clay, sand, rock fines and other materials not meeting the required gradation limits.

At least 30 days prior to delivery of rock from other than designated sources, the Contractor shall designate in writing the source from which he or she intends to obtain the rock. The Contractor will also provide satisfactory documentation to the Technician that the material meets the requirements of the specifications. The Contractor shall provide the Technician free access to the source for the purpose of obtaining samples for testing. The size and grading of the rock shall be as specified in the special provisions.

Rock from designated sources shall be excavated, selected and processed as necessary to meet the quality and grading requirements in the special provisions. The rock shall conform to the specified grading limits when installed in the riprap.

4. SUBGRADE PREPARATION

The subgrade surfaces on which the riprap or bedding course is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall conform to the requirements of the specified class of fill.

Riprap shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved by the Technician.

5. EQUIPMENT-PLACED ROCK RIPRAP

The rock shall be placed by equipment on the surfaces and to the depths specified. The riprap shall be constructed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying materials. The rock shall be delivered and placed in a manner that will insure that the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks.

Riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required to the extent necessary to prevent damage to the permanent works.

6. HAND-PLACED RIPRAP

The rock shall be placed by hand on the surfaces and to the depths specified. It shall be securely bedded with the larger rocks firmly in contact one to another. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge.

7. FILTER LAYERS OR BEDDING

When filter layers or bedding beneath riprap is specified, the filter or bedding material shall be spread uniformly on the prepared subgrade surfaces to the depth specified. Compaction of filter layers or bedding will not be required, but the surface of such layers shall be finished reasonably free of mounds, dips or windrows.

When a geotextile filter is specified, the material used shall be nonwoven and meet the requirements as outlined in Table 1. Geotextile shall be joined by overlapping a minimum distance of 18 inches. Anchoring of the fabric is not required but care shall taken to minimize displacement.

Rock riprap shall not be dropped from a height greater than three feet on protected or unprotected geotextile. Sufficient handwork shall be done to produce a dense section with a neat and uniform surface.

8. MEASUREMENT AND PAYMENT

(Used only if applicable)

Items of work for which specific unit prices are established, will be

measured to the nearest unit applicable. Payment for each item will be made at the agreed-to unit price for that item. Items of work for which specific lump sum prices are established, payment will be made at the lump sum price.

Such payment will constitute full compensation for all materials, labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Compensation for any item of work shown on the drawings or described in the special provisions but not listed on the bid schedule will be considered incidental to and included in the pay items listed on the bid schedule.

TABLE 1. REQUIREMENTS FOR NONWOVEN GEOTEXTILES

Property	Test Method	Class I ³	Class II ⁴
Tensile Strength (pounds) ¹	ASTM D 4632 Grab Test	180 min.	120 min.
Bursting Strength (psi) ¹	ASTM D 3786 Diaphragm Tester	320 min.	210 min.
Elongation at Failure (%) ¹	ASTM D 4632	≥50	≥50
Puncture (lbs.) ¹	ASTM D 4833	80 min.	60 min.
Ultraviolet Light (percent residual tensile strength)	ASTM D 4355 150 hours exposure	70 min.	70 min.
Apparent Opening Size - AOS	ASTM D 4751	As specified, max. # 40 ²	As specified, max. # 40 ²
Permittivity (1/seconds)	ASTM D 4491	0.70 min.	0.70 min.

1 Minimum average roll value (weakest principal direction)
 2 U.S. standard sieve size
 3 Unprotected
 4 Protected (6 inches of sand or soil cover required)

Plastic Pipe--Structures, Drains and Culverts

1. SCOPE

The work shall consist of furnishing and installing plastic pipe and necessary fittings as shown on the drawings or specified herein.

2. MATERIALS

Pipe

The pipe and fittings shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform as commercially practicable in color, opaqueness, density, and other specified physical properties. The dimensions of the pipe shall be measured as prescribed in ASTM D-2122.

Pipe shall conform to requirements of the following Standard Specifications:

Polyvinyl Chloride (PVC)

ASTM D-1785 Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, 120

ASTM D-2241 Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)

ASTM D-2265 Polyvinyl Chloride (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

ASTM D-2672 Joints for IPS PVC Pipe Using Solvent Cement

ASTM D-2729 Polyvinyl Chloride (PVC) Sewer Pipe and Fittings

ASTM D-2949 3.25-Inch Outside Diameter Polyvinyl Chloride

(PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

ASTM D-3034 Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings

ASTM F-679 Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

ASTM F-758 Smooth-Wall Polyvinyl Chloride (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage

ASTM F-789 Type PS-46 Polyvinyl Chloride (PVC) Plastic Gravity Flow Sewer Pipe and Fittings

ASTM F-794 Polyvinyl Chloride (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter

AASHTO Specification M304 Polyvinyl Chloride (PVC) Ribbed Drain Pipe and Fittings Based on Controlled Inside Diameter

Acrylonitrile-Butadiene-Styrene (ABS)

ASTM D-1527 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80

ASTM D-2282 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, (SDR-PR)

ASTM D-2661 Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe

ASTM D-2751 Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings

Polyethylene (PE)

ASTM D-2104 Polyethylene (PE)
Plastic Pipe, Schedule 40

ASTM D-2239 Polyethylene (PE)
Plastic Pipe, (SIDR-PR) Based on
Controlled Inside Diameter

ASTM D-2447 Polyethylene (PE)
Plastic Pipe Schedules 40 and 80
Based on Outside Diameter

ASTM D-3035 Polyethylene (PE)
Plastic Pipe (SDR-PR) Based on
Controlled Outside Diameter

ASTM F-667 Large Diameter
Corrugated Polyethylene Tubing
and Fittings. Use only High
Density Polyethylene (HDPE)
Type III; Class C; Category 3,
4, or 5; Grade P33, or P34, as
described in ASTM D-1248,
Polyethylene Plastic Molding and
Extrusion Materials

ASTM F-714 Polyethylene (PE)
Plastic Pipe (SIDR-PR) Based on
Outside Diameter

ASTM F-894 Polyethylene (PE)
Large Diameter Profile Wall
Sewer and Drain Pipe.

Fittings and Joints

The dimensions of fittings and joints shall be measured in accordance with ASTM D-2122. Joint and fittings shall be compatible with the pipe to which they attach and shall conform to the requirements of the same ASTM designation as the pipe used.

Solvents

Solvents for solvent welded pipe joints shall conform to requirements of the following Standard Specifications:

ASTM F-656 Primers for Use in
Solvent Cement Joints of
Polyvinyl Chloride (PVC) Plastic
Pipe and Fittings

ASTM D-2235 Solvent Cement for
Acrylonitrile-Butadiene-Styrene
(ABS) Plastic Pipe and Fittings

ASTM D-2564 Solvent Cements for
Polyvinyl Chloride (PVC) Plastic
Pipe and Fittings

ASTM D-3138 Solvent Cement for
Transition Joints Between
Acrylonitrile-Butadiene-Styrene
(ABS) and Polyvinyl Chloride
(PVC) Non-Pressure Piping
Components.

Gaskets

Rubber gaskets for pipe joints shall conform to the requirements of ASTM Specification F-477, "Elastomeric Seals (Gaskets) for Joining Plastic Pipe."

Perforations for Perforated Pipe

Perforations shall be as provided by ASTM D-2729 unless otherwise specified in the Special Provisions.

3. HANDLING AND STORAGE

Pipe shall be delivered to the job site and handled by means which provide adequate support to the pipe and do not subject it to undue stresses or damage. When handling and placing plastic pipe, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting (by metal surface or rocks). All special handling requirements of the manufacturer shall be strictly observed. Special care shall be taken to avoid impact when the pipe must be handled at temperatures of 40 degrees F. or less.

Pipe shall be stored on a relatively flat surface so that the barrels are

evenly supported. Unless the pipe is specifically coated to withstand exposure to ultraviolet radiation, it shall be covered with an opaque material when outdoors for a period of 15 days or longer.

4. LAYING AND BEDDING THE PIPE

Plastic pipe conduits complete with fittings and other related appurtenances shall be installed to the lines and grades shown on the drawings and specified in the Special Provisions. The pipe shall be laid so that there is no reversal of grade between joints unless otherwise shown on the drawings. The pipe shall be placed with the bell end upstream unless otherwise specified. The pipe shall not be dropped or dumped on the bedding or into the pipe trench.

Care shall be taken to prevent distortion and damage during unusually hot or cold weather. After the pipe has been assembled in the trench, it shall be allowed to cool to ground temperature before backfilling to prevent pull out of joints due to thermal contraction.

Deflection of 30-inch thermoplastic pipe, and larger, during installation shall be controlled by strutting or orientating the pipe so the long axis is in the vertical direction. The long axis shall be 3% longer than the nominal pipe diameter. A minimum of 3 struts per pipe length shall be used. The struts shall be removed after placement of backfill near the top of the pipe.

The pipe ends and the couplings shall be free of foreign material when assembled. During the placement of the pipe, each open end of the pipeline shall be closed off by a suitable cover or plug at the end of work on the pipeline each day

and until work resumes or installation is complete.

Perforated pipe shall be laid with the perforations down and oriented symmetrically about the vertical centerline. Perforations shall be clear of any obstructions when the pipe is laid.

During installation, the pipe shall be firmly and uniformly bedded throughout its entire length, to the depth and in the manner specified on the drawings. Bell-holes shall be made in the bedding under bells or couplings and other fittings to prevent the pipe from being supported by fittings. Blocking or mounding beneath the pipe shall not be used to bring the pipe to final grade.

Earth Bedding

Unless otherwise specified, earth bedding shall be used. The pipe shall be firmly and uniformly bedded in a shaped bedding groove that closely conforms to the bottom of the pipe for a depth equal to a minimum of 1 inch or 5% of the diameter of the pipe, whichever is greater. Bell-holes of ample width and depth shall be excavated at each joint location so that the pipe is uniformly supported along its entire length. The bedding material shall be free of rocks, stones and earth clods greater than 1 inch diameter.

Sand or Gravel Bedding

When sand or gravel bedding is specified, the pipe shall be firmly and uniformly placed on a sand or gravel bed. Bell-holes of ample width and depth shall be excavated at each joint location so that the pipe is uniformly supported along its entire length. Sand or gravel fill shall be carefully placed and compacted as specified herein, as

shown on the drawings, and as specified in the Special Provisions.

Pipe Encased in Drainfill

The pipe shall be firmly and uniformly placed on a bed of the specified drainfill. Bell-holes of ample depth and width shall be excavated at each joint location so that the pipe is uniformly supported along its entire length. Drainfill shall be carefully placed and compacted as specified herein and in the Special Provisions to form a continuous uniform support around the entire circumference of the pipe. The pipe shall be loaded sufficiently during backfilling around the sides to prevent it from being lifted from its original placement.

Pipe Encased in Concrete

Pipe encased in concrete shall be securely anchored to prevent movement of the pipe during concrete placement. Pipe may be anchored to the forms or to reinforcing steel provided a clear distance of 1-1/2 inches is maintained between the pipe and the steel.

5. JOINTS

Joints may be bell and spigot type with elastomeric gaskets, coupling type with an elastomeric gasket on each end, cemented, chemically welded, or butt heat fusion. When a lubricant is required to facilitate joint assembly, it shall be a type having no deleterious effect on the gasket or pipe materials.

Pipe joints shall conform to the details shown on the drawings and specified herein and shall be watertight at the pressures specified except where unsealed joints are indicated.

Pipe shall be installed and joined in accordance with the manufacturer's recommendations except as otherwise specified.

When cemented joints are specified for PVC or ABS pipe and fittings, they shall be made in accordance with the following ASTMs and the related appendix of each ASTM; D-2855 for PVC pipe and fittings, and D-2235 for ABS pipe and fittings.

Heat-fusion and elastomeric-sealed mechanical joints shall be used when joining polyethylene pipe and fittings. All joints shall be capable of withstanding a working pressure equal to or greater than that for the pipe.

When required, pipe ends shall be cut square and be deburred to provide uniform smooth surfaces. Reference marks of crayon or pencil shall be placed on the spigot to assist in determining when the joint has been correctly made.

6. FITTINGS

Fittings fabricated for gasketed bell and spigot pipe from one piece injection molded plastic manufactured for solvent weld construction shall have a maximum 2 ft. stub of spigot and bell, as appropriate, solvent welded in place. The stubs shall be selected to permit the bell to face upstream.

Where steel fittings, valves, bolted connections, and other flanged fittings are used, they shall be painted or coated as specified in the Special Provisions.

The fittings shall be of the same or similar materials as the pipe and shall provide the same durability and strength as the pipe, unless otherwise specified herein or shown on the drawings.

7. BACKFILL

Initial Backfill

The pipe shall be held down during backfilling to the top of the pipe to prevent it from being lifted from its original placement.

Hand or mechanical compaction may be used. Water packing may be used for pipe 18 inches or less in diameter.

Initial backfill material shall be soil or sand that is free from rocks or stones larger than one inch in diameter. At the time of placement, the moisture content of the material shall be such that the required degree of compaction can be obtained with the backfill method to be used. Initial backfill material shall be placed so that the pipe will not be displaced, excessively deformed, or damaged.

If backfilling is done by hand or mechanical means, the initial fill shall be compacted firmly around and above the pipe to a density equivalent to that of adjacent fill or foundation materials.

Initial backfill shall extend a minimum of 12 inches above the top of pipe.

If the water packing method is used, the pipeline first shall be filled with water. The initial backfill before wetting shall be of sufficient depth to insure complete coverage of the pipe after consolidation. Water packing is accomplished by adding water to diked reaches of the trench in sufficient quantity to thoroughly saturate the initial backfill without excessive pooling of water. After the backfill is saturated, the pipeline shall remain full until after the final backfill is made. The wetted fill shall be allowed to

dry until firm before beginning the final backfill.

Final Backfill

The final backfill material shall be free of large rocks, frozen clods, and other debris greater than 3 inches in diameter. The material shall be placed and spread in approximately uniform layers so that there will be no unfilled spaces in the backfill. The backfill will be to the level of the natural ground or to the design grade required to provide the minimum depth of cover after settlement.

Rolling equipment shall not be used to consolidate the final backfill.

Special Backfill

All special backfilling requirements of the pipe manufacturer shall be met.

8. MEASUREMENT AND PAYMENT

(Used only if applicable)

For items of work for which specific unit prices are established, each item will be measured to the nearest unit applicable. Payment for each item will be made at the agreed-to unit price for that item. For items of work for which specific lump sum prices are established, payment will be made at the lump sum price.

Such payment will constitute full compensation for all materials, labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Compensation for any item of work shown on the drawings or described in the Special Provisions but not listed on the bid schedule will be considered incidental to and included in the pay items listed on the bid schedule.

Drainfill and Filters

1. SCOPE

The work shall consist of furnishing, placing and compacting drainfill required in the construction of structure drainage systems.

2. MATERIALS

Quality. Drainfill materials shall be sand, gravel, crushed stone or mixtures thereof obtained from the specified sources. They shall be selected as necessary to avoid the inclusion of organic matter, clay balls, excessive fine particles or other substances that would interfere with their free-draining properties.

Aggregates of crushed limestone shall be thoroughly washed and screened. Coarse aggregate containing crushed limestone shall have not more than 3 percent by weight of particles finer than the No. 4 sieve. Crushed limestone shall not be used for fine aggregates except in combination with other materials such that not more than 5 percent of the portion finer than the No. 4 sieve shall be crushed limestone.

If a source is not specified in the special provisions, drainfill materials shall conform to the following requirements. At least 30 days prior to delivery of the materials to the site the Contractor shall inform the Technician in writing of the source from which they intend to obtain them. The Contractor shall provide the Technician free access to the source for the purpose of obtaining samples for testing.

Aggregates shall be tested for soundness according to ASTM Method

C-88, and shall have a weighted average loss in five cycles of not more than 12 percent when sodium sulfate is used or 18 percent when magnesium sulfate is used.

Grading. Drainfill and filter aggregates shall conform to the specified grading limits after being placed in the work, and after being compacted if compaction is specified. Grading shall be determined by ASTM Method C-136. The percentage of material finer than the No. 200 sieve shall be determined by the method in ASTM Designation C-117.

Storing and handling. Drainfill and filter aggregates shall be stored and handled by methods that prevent segregation of particle sizes or contamination by mixing with other materials.

3. BASE PREPARATION

Foundation surfaces and trenches shall be clean and free of organic matter, loose soil, foreign substance, and standing water when the drainfill is placed. Earth surfaces upon or against which drainfill will be placed shall not be scarified.

4. PLACEMENT

Drainfill shall be placed uniformly in layers not more than 12 inches deep before compaction. When compaction is accomplished by manually controlled equipment, the layers shall be not more than 8 inches deep. The material shall be placed in a manner to avoid segregation of particle sizes and to insure the continuity and integrity of all zones. No foreign materials shall be allowed to become

intermixed with or otherwise contaminate the drainfill.

Traffic shall not be allowed to cross over drains at random. Equipment crossovers shall be maintained, and the number and location of such crossovers shall be established and approved prior to the beginning of drainfill placement. Each crossover shall be cleaned of all contaminating materials before additional drainfill is placed.

Any damage to the foundation surface or the sides or bottoms of trenches occurring during placement of drainfill shall be repaired before drainfill placement is continued.

The upper surface of drainfill constructed concurrently with adjacent zones of earthfill shall be maintained at an elevation at least one foot above the upper surface of the adjacent fill.

Drainfill over or around pipe or drain tile shall be placed in a manner to avoid any displacement in line or grade of the pipe or tile.

Placement of drainfill adjacent to structures shall not be started until the required time intervals shown in Table 1 have elapsed after placement of the concrete.

5. CONTROL OF MOISTURE

When the addition of water is required, it shall be applied in such a way as to avoid excessive wetting to adjacent earthfill. Except as specified in the Special Provisions, control of moisture content will not be required.

6. COMPACTION

Unless specific compaction requirements are specified by the Special Provisions, no compaction will be required beyond that resulting from the placing and spreading operations.

Heavy equipment shall not be operated within 2 feet of any structure. Vibrating rollers shall not be operated within 5 feet of any structure. Compaction by means of drop weights operating from cranes or hoists will not be permitted.

7. MEASUREMENT AND PAYMENT

(Used only if applicable)

For items of work for which specific unit prices are established, each item will be measured to the nearest unit applicable. Payment for each item will be made at the agreed-to unit price for that item. For items of work for which specific lump sum prices are established, payment will be made at the lump sum price.

Such payment will constitute full compensation for all materials, labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Compensation for any item of work shown on the drawings or described in the Special Provisions but not listed on the bid schedule will be considered incidental to and included in the pay items listed on the bid schedule.

TABLE 1

Structure	Time Interval
Retaining walls and counterforts (impact basins)	14 days
Walls backfilled on both sides simultaneously	7 days
Conduits and spillway risers, cast-in-place (with inside forms in place)	7 days
Conduits and spillway risers, cast-in-place (inside forms removed)	14 days
Conduits, precast, cradled	2 days
Conduits, precast, bedded	1 day
Cantilever outlet bents (backfilled both sides simultaneously)	3 days

3

CONSTRUCTION SPECIFICATION

MT-7 VEGETATING STRUCTURES

1. SCOPE

The work shall consist of site preparation and furnishing and applying the specified materials to establish permanent vegetation at the designated locations.

All areas where vegetation has been disturbed during construction (e.g., waste, borrow, and equipment parking areas) and all other earth construction (e.g., cut slopes, earth embankments) shall be seeded following completion of construction. (Site conditions may exist where it is impossible to establish vegetative cover, e.g., rock cuts, bentonite or raw shale. If the establishment of vegetation is impractical, the responsible technician must indicate the reasons on the construction plans.)

2. MATERIALS

Specific materials for permanent vegetation at each site shall be as shown on the drawings or as specified in an attachment to this specification. Unless otherwise specified, all specified materials shall meet the following requirements.

2.1 Seed

All seed shall be labeled in accordance with state laws and the U.S. Department of Agriculture rules and regulations under the Federal Seed Act in effect on the date of invitations for bids. Bag tag figures will be evidence of purity and germination. No seed will be accepted with a date of test more than nine months prior to the date of delivery to the site.

Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be accepted. The percent of noxious and other weed seed allowable shall be as defined in the current state laws relating to agricultural seeds. Each type of seed shall be delivered in separate sealed containers and fully tagged unless exception is granted in writing by the Technician.

2.2 Inoculant

The inoculant for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species and shall not be used later than the date indicated on the container or as otherwise specified. A mixing medium as recommended by the manufacturer shall be used to bond the inoculant to the seed. Inoculation of legumes shall be done within 48 hours before seeding.

2.3 Fertilizers

Fertilizers shall be free flowing, suitable for application with hydraulic or pneumatic-type equipment or fertilizer spreaders, delivered to the site in bags or other convenient containers fully labeled, conforming to applicable state fertilizer laws and bearing the name, trade names, or trademarks, composition, and warranty of the producer. Caked or lumpy fertilizer will not be accepted.

All fertilizer shall be in a form readily available to plants.

2.4 Mulch

Straw or hay mulch shall be of the type specified (e.g., native grass hay, tame grass hay, other hay, or small grain straw). Weed seed content shall be at a level acceptable to the Technician with no noxious weed seeds present. Mulching machines shall be such that mulch can be applied in a uniform manner. Mulch shall not be musty, moldy, caked, decayed, or of otherwise low quality.

Wood cellulose fiber mulch shall consist of a specially prepared fiber processed to contain no growth- or germination-inhibiting factors. The fiber mulch shall be manufactured and processed in such manner that the wood cellulose fibers will remain in uniform suspension in water under agitation and will blend with grass seed, fertilizer, and other additives to form a homogeneous slurry. The processed mulch material shall have characteristics to form a blotter-like ground cover on application, having moisture absorption and percolation properties and the ability to cover and hold grass seed in contact with soil. The wood cellulose fiber mulch material shall be furnished in packages of uniform weight (plus or minus 5 percent) and bearing the name of the manufacturer and air-dry weight content. Upon request of the Technician, suppliers shall furnish certification that laboratory and field testing of their product has been accomplished and that it meets the foregoing requirements and intent.

2.5 Stabilizing Materials

Asphalt emulsion shall be gasoline (naphtha), cutback asphalt MC-2 or MC-3, or Emulsified Asphalt SS-1, SS-2, or MS-2, meeting the requirements of the Asphalt Institute.

Jute matting shall be of a uniform open plain weave of undyed and unbleached single jute yarn. The yarn shall be of loosely twisted construction and shall not vary in thickness by more than one-half its normal diameter. Jute matting shall have a minimum width of 48 inches and shall contain 78 warp ends and 41 weft ends per yard. In any one shipment, the weight of matting shall average 1.22 pounds per linear yard or 48-inch-wide matting and with proportional weight for wider matting with a tolerance of plus or minus 5 percent.

2.6 Topsoil

Topsoil or soils materials capable of supporting plant growth shall be borrowed from designated areas and only to the depth shown on the drawings or designated by the Technician. The area from which this material is removed will be seeded to permanent vegetation as shown on the drawings or as designated by the Technician.

3. NOTICE OF PROCEDURE

The Contractor shall give the Technician at least 2 days' notice of the time and place of starting his operations and shall continue to advise as to his schedule of operations.

4. TOPSOILING

Where specified, topsoil or soils materials shall be applied uniformly on the designated areas to the depth required.

5. SEEDBED PREPARATION

The entire area to be seeded shall be reasonably smooth and free of debris which would interfere with seeding operations. All rills, depressions, and ridges shall be smoothed prior to seedbed preparation. The seedbed will be loosened to the specified depth (1 to 2 inches if not specified) with a disc, spiketooth harrow, or similar tillage equipment, unless the Technician determines it is already sufficiently loosened.

Seedbed preparation shall be suspended when soil moisture conditions are not suitable for the preparation of a satisfactory seedbed as determined by the Technician.

6. SEED APPLICATION

The time and method(s) of seed application shall be as shown on the drawings or as specified in an attachment to this specification. The seed shall be applied uniformly on the prepared areas at the specified rates.

When more than one kind of seed is to be used, the several different kinds may be mixed together in the required proportions and used as a seed mixture.

Method A. Seedings on all slopes 3:1 and flatter shall be done with a grass or grain drill in rows 4 to 14 inches apart. The seed shall be placed at a depth of approximately 3/4 to 1 inch on coarse-textured materials and one-half inch on other sites.

Method B. Seedings on slopes steeper than 3:1 shall be by hand or machine broadcasting. Broadcast seed shall be covered about one-fourth to one-half inch deep by light spiketooth harrowing or similar method unless applied in the mulch.

Method C. The hydro-seeding method of application is applicable to few locations and sites in Montana. When specified, all materials shall be applied by hydraulic type equipment that provides a continuous mixing and agitating action to the mixture of water, fertilizer, seed, and mulch. The mixture shall be applied through a pressure spray distribution system providing a continuous, non-fluctuating discharge and delivery of the mixture in prescribed quantities uniformly on the specified areas. Seedbed preparation, if required, shall be as specified in an attachment to this specification.

Method D. In pneumatic seed application, all materials shall be applied by blower-type equipment using air pressure and an adjustable disseminating device whereby dry fertilizer and dry seed shall be applied in prescribed quantities uniformly on specified areas. Seedbed preparation, if required, shall be as specified in an attachment to this specification.

Method E. Seed application by hand-operated mechanical spreaders or seeders shall be performed such that dry seed will be applied uniformly in the prescribed quantities on specified areas.

7. FERTILIZING

Fertilizer not applied with other material shall be applied separately and uniformly in the prescribed amounts to the entire area to be seeded as shown on the drawings or as specified in an attachment to this specification.

8. MULCHING

The kind of method to be used shall be specified. Mulches shall be applied uniformly to the designated areas at the specified rates. If not applied with the seed, mulch shall be applied not later than 2 work days after seeding has been performed. The type, rate, and method of anchoring mulch shall be as shown on the drawings or specified in an attachment to these specifications.

When specified, a weighted disc harrow shall be used to stabilize or anchor the mulch. The disc harrow with the discs set straight shall be run over the mulched areas on the contour. A notched colter-type disc is superior. The mulch shall be adequately anchored to a depth of about 2 inches with a minimum space of 12 inches between the colters.

Small areas may be anchored by hand with a square point spade. Mulch shall be pushed into the soil two inches deep at approximately 12-inch intervals.

When specified, asphalt emulsion shall be used to stabilize or anchor the mulch. Asphalt emulsion shall be applied uniformly over the mulch at the rate of 200 gallons per acre or may be applied by injecting the designated asphaltic materials into the mulch as the mulch leaves the mulch spreader at the rate of 100 gallons per ton of mulch.

When specified, jute matting shall be used for stabilizing the mulch. Jute matting shall be installed in accordance with the manufacturer's instructions.